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Trachoma

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By

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EVANSVILLE, IND.

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TRACHOMA, WITH ESPECIAL REFERENCE TO THE STATE OF MINNESOTA.*

By Taliaferro Clark,
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Comparatively few of our fellow citizens realize our country is annually invaded by an army of approximately one million people. It is a vast army, on conquest bent, marching, not to the blare of martial music in the shadow of flags of battle, but steadily, monotonously, in the stride of industrial feet,—the great army of foreign immigration. In every army are to be found excellent soldiers, indifferent soldiers, and "hangers-on." So with the army of aliens arriving at our shores, consisting, for the greater part, of worthy people seeking to better their condition. Still this army has its large quota of camp followers.

Our forefathers, for the sake of political and religious liberty, braved many perils by sea and by land to establish themselves in the virgin land of the west. Only the fit attempted and the strong accomplished such an undertaking. Today immigrants arrive by the thousand in floating palaces, surrounded and guarded by every mod-

*Read at the 44th annual meeting of the Minnesota State Medical Association at Duluth, August 13 and 14, 1912.

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ern device for comfort and safety. Agencies and subagencies of the great transportation companies are located along the way, like sign-posts, to direct and guide the present-day immigrant from the time he leaves his native village until the journey is ended. Step by step with this increased safety and comfort, more and more defectives have sought entry to our country, and in such numbers that Congress, from time to time, found it necessary to enact increasingly stringent laws regulating immigration, denying entry to undesirables.

Several years prior to 1897, oculists were viewing with alarm the great increase in the number of cases of contagious ophthalmia in persons of foreign birth seeking relief at the various clinics and dispensaries of our cities. Finally, in this year, on the strength of such representations, the Secretary of the Treasury declared trachoma a dangerous, contagious disease, bringing it within the mandatory provisions of the immigration law denying entry to the country to persons so afflicted. From this time on the study of trachoma has become a matter of growing interest and importance to a host of patient, scientific investigators in this country.

Indeed, only quite recently, the Russell Sage Foundation called a conference in New York and organized the American Association for the Conservation of Vision, whose duty it shall be to systematize the chaotic forces of our country, for the prevention of blindness from all causes, not the least important of which is trachoma.

Trachoma is as old as civilization. If we accept the deductions of the Medical Historian from the Ebers papyrus, it existed in Egypt fifteen hundred years before the time of Hippo-

crates. To the Napoleonic wars is given the credit of its spread throughout Europe. Boldt claims that trachoma was quite prevalent in Europe prior to the return of Napoleon's army from Egypt, and that the ensuing wars hastened its spread by reason of conscriptions and the custom of quartering troops with the inhabitants.

Of greater interest to us of the present time is the fact that trachoma is now a world-wide disease. The writer, in the eleven years he was engaged in the medical examination of arriving aliens, has seen cases coming from Europe, Asia, and Africa, West Indies and South America. The disease is liberally distributed throughout the United States. There are many cases in the state of Minnesota. There are cases of the disease even here in the city of Duluth.

PREDISPOSING CAUSES

The cause of trachoma is yet an unknown quantity. Many and varied agencies and conditions have been considered predisposing. Such has been the case with every obscure disease. Of these conditions we may mention air, water, soil, altitude, age, sex, race, individual susceptibility, general state of health, etc.

The writer does not believe that trachoma is an air-borne disease, except possibly and merely as an adventitious circumstance. S. Stephenson[2], reporting on one of the English ophthalmic schools, says that during five years not a single case occurred among the sixty-five nurses or the sixteen teachers, or among any of the help. This school was conducted on the assumption that contagious eye-affections are spread by direct or indirect conveyance of specific discharges from eye to eye. Sulzer[3], on the other hand, says that

many more cases of trachoma develop in Java during the dry season than in the wet. The explanation seems simple: irritation from dust causes many quiescent trachomas to become active with increased secretion, *pari passu*, more virus is spread by these sufferers. Healthy eyes also become irritated, and the fingers are in contact with the eyes more frequently, affording a greater liability to convey infection directly.

A great many writers dwell on the point that trachoma is a disease of low-lying, well-watered countries, and maintain that the condition of the soil and amount of moisture therein are necessary for the propagation of trachoma virus. Dr. W. H. Harrison[4], of the Indian Medical Service, on the other hand, reports 60 per cent of one band of Puebla Indians, living at an altitude of 7,000 feet, in New Mexico, afflicted with trachoma.

It has often been asserted that certain races are immune to trachoma. The exceptional facilities afforded officers of the Public Health Service, in their work examining arriving aliens, renders them skeptical of the truth of such an assumption. We find no race is immune. That the disease is more prevalent among some than others is true, but this is explained by the greater or less degree of social refinement of the laboring class in states or communities so afflicted. The negro is not immune to the disease. He has simply been protected by environment. In the South he is socially ineligible for trachoma. Communities in this country in which trachoma is now prevalent are those most affected by the tide of immigration. The South has received but a small percentage of aliens, therefore but little trachoma has been introduced, and, even where

introduced, social restrictions have been such as to protect the negro.

The writer, in a recent investigation in co-operation with the State Board of Health, found a very high percentage of trachoma among the Chippewa Indians of this state. An examination of school children in surrounding communities showed no trachoma in the white population. The lack of social intercourse between the whites and Indians explains the protection of the former.

Feuer[5], quoted by Boldt in his most excellent work on trachoma, says: "When contagion has once been sown amongst a peasant population, it is scarcely possible to prevent its further spread. The younger generations continue to dwell on the same farm, young wives marry into the family, and, if any have trachoma, transmit it, not only to their husbands, but also to the whole household. The common towel, the cross before the church, which is touched and kissed by everyone, the tender embraces indulged in under the influence of alcohol—all help to spread the disease."

* * * * * *

"At another farm a group may be seen seated on the ground busily sorting dried tobacco leaves; from time to time one or other arises, goes to the table, and washes his eyes, which are irritated by tobacco dust, and dries them with the common towel. Lastly we may describe the abominable custom which is practiced in Alföld: The bride or young wife, as the case may be, goes from one wedding guest to another, washes each one's face from a common wash basin, certainly very superficially, and then hands him the common towel to dry it with." Alföld is one of the most heavily infected districts in Hungaria.

The customs, habits, morals, and degree of ignorance determine the prevalence and propagation of trachoma, when once introduced into a community, rather than climate, soil, water or location.

Unfortunately, the opinions of the vast majority of writers on trachoma have been founded on observation of limited communities, the salient features only of which have impressed them as being a causative factor, hence such divergence of opinion.

No age is exempt, excepting the very young, and that for histological reasons, to be explained later.

Individual susceptibility certainly plays an important rôle, and is unquestionably exhibited in other diseases. In addition, the conjunctiva, weakened by previous or existing inflammation, by injuries, by a lowered general physical condition, certainly offers less resistance to invasion by the infecting agent of trachoma. Such conditions are not essential. The writer has seen the disease repeatedly in the otherwise healthy and robust, and strong.

BACTERIOLOGY OF TRACHOMA

The biology of trachoma is far from settlement, and our present knowledge thereof is of importance only to the practical bacteriologist.

Insofar as the average practitioner of medicine is concerned, the "it is" and "it is not" of the bacteriologists, combined with the yet unsettled general opinion of the clinical aspect of trachoma, is simply compounding of confusion.

It is not the purpose of the writer to decry the earnest work of a host of patient and painstaking bacteriologists, nor to minimize the great ad-

vances made toward the solution of the problem, but solely to emphasize the fact that we do not yet know the causative agent of trachoma, and that we must, for the present, content ourselves with a diagnosis based on the clinical aspect of the disease, and endeavor to gain a clear and uniform conception of its clinical manifestations.

A host of organisms have been isolated from trachomatous eyes from time to time, leading one to the conclusion that trachoma is, more often than not, a mixed infection.

Halberstaedter and Van Prowaczek[6] found, in 1907, in Java, certain intra-epithelial bodies in the trachomatous conjunctiva, called by them *chlamydozoa.* Within these enclosures were found round coccus-like bodies with a light areol., which multiply by division, assuming the form of diplococci, and which stain red or reddish violet. (Giemsa.)

About the same time, Professors Greeff, Frosch, and Clausen[7], of the Royal Prussian Commission, found in the secretion, the epithelium, and the trachomatous follicle certain very small, point-shaped, double bacilli-like bodies, which appear round in high magnification, always surrounded by a light areola, single and in groups. Those they called trachoma bodies.

These inclusions and the so-called extra-cellular initial bodies, described by Lindner[8], representing, as they do, a distinct advance in our knowledge of trachoma, now occupy the center of the controversial stage, to-wit: their nature and their significance.

Greeff[9], four years after his first reports, summarizes the matter. He denies, to a certain extent, that these formations are morphologically exactly determined, so that they can be surely

distinguished from other formations; asserts that they are found in other conditions than trachoma; and says: "If I am asked for my opinion as to the significance of trachoma corpuscles, I must readily answer: I do not know." He further naively remarks: "If I see that the same author had to change his opinion, within a short period, three or four times, and had to adapt it to each new finding, one must concede that the theories were not stimulating or fertile, but impeding."

Noguchi and Martin Cohen[10] conclude that the finding of trachoma corpuscles in a few cases of conjunctivitis follicularis (9 in 250 cases), in trachoma, blennorrhea neonatorum, non-gonorroica, and in blennorrhea gonorrhoica in children, suggests the hypothesis that the so-called trachoma bodies represent an etiological factor in an independent conjunctival affection which is not complicated by pannus or cicatrization and which clinically resembles trachoma with acute manifestations or the papillary stage of blennorrhea gonorrhoica. On this hypothesis the presence of the so-called bodies in trachoma and in blennorrhea gonorrhoica is to be interpreted as the result of the engrafting of the disease caused by these bodies on the original infection.

Finally, Addario[11] doubts their specificity, because, besides finding them in other conjunctival inflammations, he also found them in the normal conjunctiva.

Dr. Anna Wessels Williams[12] has recently published an account of the finding in a case of a tiny hemoglobinophilic bacillus which has a morphology and staining characteristics very similar to those of some of the trachoma inclusions. The basic fact is her belief that in the cul-

ture of the tiny hemoglobinophilic bacillus, she has secured, morphologically, a culture of trachoma inclusions.

In all she has isolated 128 strains of a hemoglobinophilic bacillus, without being able to find any distinct differential point between any of them and those of the bacillus influenzæ.

It is of interest to note that L. Muller[13], in 1897, found, in 23 out of 63 cases of trachoma, a baccilus, culturely, not distinguishable from the bacillus influenzæ.

The microscopic study of the causative agent of trachoma, though interesting, important, and of great promise, is still *sub judice,* and can not be relied on for purposes of diagnosis.

THE PATHOLOGY OF TRACHOMA

The pathology of trachoma is simple. The sac formed by the inner surfaces of the lid and eyeball is lined with the conjunctiva, which is covered by several layers of cylindrical epithelium on the palpebral portion and in the fornix, the ocular portion being covered by flat epithelium. At the margin of the cornea the conjunctiva becomes firmly attached to the underlying structure and somewhat thickened, forming what is known as the limbus corneæ, but is continued over the cornea, by its pavement epithelium. The palpebral conjunctiva presents a velvety appearance, on close inspection, produced by an irregular reticulate arrangement of minute grooves and pits forming pseudopapillæ.

The mucous layer proper of the conjunctiva presents a discrete infiltration of lymphoid cells in the meshes of its connective tissue. This adenoid layer is not found in the conjunctivæ of the very young, and begins to form within a few

months after birth, but may be delayed as long as the third year. For this reason it is an exception to find trachoma in a child under two years of age. This adenoid layer is not found in the scleral portion of the conjunctiva.

At the convex border of the tarsus are found numerous acinomucous glands, and in the fornix the analogous follicles of Krause.

In trachoma there is an enormous lymphoid infiltration with cells aggregating into masses, forming papillæ, which, after receiving a vascular supply, degenerate, rupture, and undergo cicatrization with the formation of the characteristic scar tissue of trachoma.

SYMPTOMS OF TRACHOMA.

External manifestations of trachoma vary with the stage of the disease, and are most obvious in the first and last.

It has frequently been stated that there is no such thing as acute trachoma, that the disease begins insidiously, that its existence is sometimes discovered fortuitously, and in other cases not until some of its complications call attention to the true underlying affection. The weight of our experience certainly bears in the other direction. It is the writer's belief that trachoma first manifests itself as an acute inflammation of varying intensity; and that an accurate history of every case would show it did so begin.

The disease is more prevalent among people who seek medical advice only in the grave issues of life, and who would hardly seek relief at the hands of a physician for an inflammation of the eye unless extraordinarily severe.

The writer has, time and again, in the examination of immigrants, been impressed with the

apparent insensitiveness of the conjunctiva in very many of these people, evidenced by the presence of foreign bodies, so frequently discovered on eversion of the eyelids, exciting no complaint on the part of the subject. Surely it would require a severe condition of the eyes to cause such an individual to seek medical assistance.

In the number of acute cases it has been the advantage of the writer to see, the commencement was that of a severe conjunctivitis, with lachrymation, photophobia, and pain. The lids were swollen, but not greatly so, except in a few cases. The ocular conjunctiva was injected, and in some instances considerable chemosis was present. The act of everting the lid caused considerable pain. The palpebral conjunctiva and that of the fornix was congested, turgid, and thrown into folds with swelling of the normal follicles. Later, in spite of treatment, the discharge became sanguino-purulent and mucopurulent with the development of numerous papillæ, the beginning of an acute papillary invasion. These papillæ vary in size according to situation and the density of the conjunctiva. They are smaller in the closely adherent tarsal conjunctiva and are of increasing size as the fornix is approached, where, at times, coalescing, they may assume distinct masses or folds. In a very dense and tightly adherent conjunctiva, they may not become visible until after the subsidence of acute inflammation. In color they vary according to the amount of inflammation and the laxity of the conjunctiva, being red in a lax and greatly inflamed conjunctiva and becoming reddish-yellow to gray with the subsidence of inflammation. In the early stage of pa-

pillary formation the reflex is glistening, but later becomes dull, like that of raw, lean meat. The stage of acute papillary invasion, after a varying period, gradually merges into that of scar-tissue formation, in which the first external manifestations of the disease are less obvious, in uncomplicated cases. Secretion diminishes, ocular congestion clears up, and photophobia passes away. Everting the lid there seem to be faint lines of cleavage in the aggregation of papillæ, the forerunner of radiating lines of scar-tissue, which are later to become manifest as minute whitish lines, the beginning of nature's reparative work. With the advancement of cicatrization, the so-called granulations of trachoma are often found separated into bands or islands, a very characteristic appearance of cases far advanced toward spontaneous recovery. Gradually the conjunctiva smooths over, the superficial layer of which is thrown into tiny folds and gives a clear reflex, wavy like glass that has been melted and drawn out. This is especially to be observed in the tarsal sulcus, forming the so-called cicatricial band of Arlt. The amount of scar-tissue formation in the lower lid is seldom so great as in the upper. It has been suggested that this is due to the probable absorption of trachoma papillæ, owing to the laxity of the tissues in that situation. The writer desires to re-assert, in this paper, that he has never seen a case of acute trachoma which, it could be definitely asserted, had its incipiency on the lower lid.

The first external manifestation of scar-tissue formation is a lagging of the lid on movement of the eyes. Later, there is ptosis, the edges become thickened and eventually clubbed.

At any time during the period of cicatrization,

a trachomatous eye may undergo an exacerbation and become acutely inflamed, so that it often becomes necessary to wait until such inflammation subsides, before the true nature of the underlying process can be determined, in such an eye seen for the first time. Whether such exacerbation is due to some of the well-known organisms, or to a reinfection, is a question which can not be definitely determined until the etiology of trachoma rests on some sure bacteriological foundation.

THE CAUSE OF TRACHOMA

The course of trachoma is essentially chronic. The so-called abortive forms are of doubtful diagnosis; certainly an inflammation of the conjunctiva that cleans up readily, leaving no traces of the disease process, is not characteristic of trachoma, which so stubbornly resists treatment.

TYPES OF TRACHOMA

So also with the so-called types of trachoma. Such division is arbitrary and confusing. Trachoma is always one and the same. The varying appearance of the conjunctiva is due to the varying virulence of the exciting agent, natural resistence of the tissue, intensity of inflammatory process and to the histological structure, whether rich in lymphoid cells or not, whether lax or firm, and, to a certain extent, to the varying vascularity of different conjunctivæ.

It is necessary to have a clear conception of the normal appearance of the conjunctiva, combined with some experience of trachoma, to enable the practitioner to draw accurate conclusions from such varying appearances.

PANNUS

Pannus is considered by some authorities a complication of trachoma, and by others a direct extension of the trachomatous process, in other words, a symptom. It is usually found occupying the upper half of the cornea, and may involve the whole surface. Pannus is characterized by a brawny haziness of the cornea, somewhat translucent, and consists of an infiltration of cells between the conjunctival epithelium and Bowman's membrane. Throughout this infiltration are seen vessels extending over from the sclera, branching many times. This cellular infiltration may be thick in spots, giving the pannous film a roughened or nodular appearance. Should the process extend deep, with injury to Bowman's membrane, the result is ectasia corneæ, and even formation of ulcers.

One of the most notable believers in the unity of pannus and trachomatous extension is Fuchs. On the other hand it is the belief of many that pannus is produced by an irritation by the diseased upper lid, and that its situation in the upper portion of the cornea indicates such is the case. It is certainly hard to reconcile the conditions as a trachomatous extension with the known freedom of these structures from adenoid tissue, and also with the fact that pannus may be seen late in the disease, coincident with entropion, trichiasis, and a sclerosed conjunctiva.

SEQUELLAE

Distortion of the lids, producing entropion and ectropion, trichiasis and districhiasis, is the result of contraction of the scar-tissue formed in the layers of the conjunctiva. It has already been explained that cicatrization begins sooner

and proceeds more rapidly in the tarsal sulcus. This contraction draws down the fornix until it may be obliterated and the conjunctiva passes directly from the lid to the bulb. At the same time the tarsus becomes warped and twisted, producing deformities already mentioned.

Epiphora is caused by obliteration of the caruncle and closure of canaliculi by cicatricial contraction. Narrowing of the palpebral slit is occasioned by thickening and distortion of lids, as well as by the formation of symblephara.

Pannus, failing to clear up, staphyloma, and scars of healed ulcers occasion blindness. Blindness is also induced, late in life, when the circulation of lymph is normally sluggish, by pressure of the thickened lids of a recovered trachoma, impeding still further the flow of lymph in the meshes of the corneal structure, which, combined with irritation, interferes with its proper nutrition.

PROGNOSIS

Prognosis for vision is not good. About 90 per cent of all cases of trachoma result in damage to vision, ranging from slight refractive errors, due to change in corneal curvature, to complete blindness.

DIAGNOSIS

The diagnosis of trachoma must, for the present at least, be based on the clinical aspect of the disease as evidenced on inspection.

No person is competent to diagnose trachoma, in its protean manifestations, who has not acquired a clear conception of the appearance of the normal conjunctiva and the changes often found therein that are without pathological significance.

The writer finds it more advantageous to examine for trachoma with the patient standing. The examining physician should stand with his back to the light, the patient facing him. The patient's chin is tilted, throwing the head back, thus causing him to look downward, rendering it very easy to expose the superior cul-de-sac fully and without discomfort.

For this purpose the writer uses a small collar buttoner. It is nothing more than a small loop of rigid wire continued into a short metallic handle, which is easy to keep clean and does not cause pain.

With the patient's head in the position indicated, the eyelashes are grasped by the fingers and thumb of the left hand and the lid drawn away from the eyeball and upward, at the same time pressing gently downward and slightly backward with the buttoner against the palpebral fold until the whole conjunctiva is exposed. Artificial light should not be used in making the diagnosis of a doubtful case. The detection of beginning scar-tissue formation with artificial illumination is certainly not so easy or so sure as by daylight.

The diagnosis is made certain by the presence of the so-called hyperplastic granulations associated with the formation of scar-tissue. On those two hang all the "Law and the Prophets" of trachoma. It is possible for one of much experience to predict with great certainty the presence of trachoma from the appearance of the granulations alone, but assurance is made doubly sure by the presence of scar-tissue.

The experience of the writer has been that trachoma once well engrafted cannot be aborted. It can be modified in its course and controlled,

but there always remains this scarring that tells of the struggle.

Pannus has been considered a diagnostic symptom of trachoma, but it is not constant, occurring in 30 per cent to 50 per cent of the cases.

DIFFERENTIAL DIAGNOSIS

Trachoma is to be differentiated from follicular conjunctivitis. Arguments concerning the unity or duality of the two, on the part of the several supporters of these theories, remind one of the knight in Butler's Hudibras:

"On either side he would dispute,
Confute, change hands, and still confute."

Follicular conjunctivitis is a follicular hypertrophy not a hyperplasia. The conjunctiva does not lose its mirror-like reflex, and the follicles are never infiltrations, but seem rather as if set on the conjunctiva. The conjunctiva is not infiltrated or thickened; there is no scar-tissue formation and no pannus. It is an affection due to long-continued irritation, mechanical, chemical, or refractive. It is amenable to treatment and leaves the conjunctiva unchanged.

In chronic cases it is often attended with the formation of chalky deposits, a condition the writer has never seen in trachoma. It is not contagious, and may exist for years without causing any corneal involvement. It often disappears suddenly without treatment, which is not the case with trachoma.

The examiner will frequently be confronted with an *inflamed* conjunctiva showing hypertrophied follicles without the formation of scar-tissue, in communities where trachoma is prevalent. Such cases should be regarded with suspicion. Application of the therapeutic test, with

attention to the proper hygiene of the eye, will clear the diagnosis.

Parinaud's conjunctivitis need cause no trouble. It is frequently attended with constitutional symptoms, is usually confined to one eye, is accompanied by an enlargement of the pre-auricular and cervical glands on the affected side, has a tendency to ulcerate, and exhibits polypus-like formations in the conjunctiva that may project below the margin of the lids. The condition clears up under treatment leaving the conjunctiva smooth.

In vernal catarrh, of Frühjahr's conjunctivitis, the conjunctival surface is studded with small elevations which may be mistaken for trachoma follicles. They are broader, flatter, in orderly arrangement, likened unto a mosaic, the whole frequently covered by a milky film. This disease is more or less chronic and tends to recur, but yields to treatment and leaves the conjunctiva unmarred.

The finding of "trachoma inclusions" in certain types of gonorrheal blennorrhea raises once more the question of the duality of the two diseases. The writer can express the situation no better than in the language of Greef: "In gonorrhea follicles never occur, not in the whole course, not even microscopically. No cirrhosis follows. This is neither macroscopically nor microscopically present after the termination of the disease. The gonorrhoic ophthalmia never becomes chronic. Whether the cornea has remained intact or been destroyed, after a certain time nothing is found in the conjunctiva, not even in excised microscopical pieces, which I have examined repeatedly."

The writer has never seen a case of gonor-

rheal ophthalmia which did not respond to treatment, producing no changes other than corneal.

Furthermore, accepting the statistics of genito-urinary surgeons as to the enormous prevalence of gonorrhea in urban populations, there should be a proportionate manifestation of trachoma among such populations. On the contrary, in many cities and towns having a high percentage of venereal infection, trachoma is practically unknown.

Acute conjunctivitis can be confounded only with the early stage of trachomatous invasion. The normal conjunctiva is marked by a reticulate arrangement of numerous pits and furrows and certain mucous glands. The uneven swelling of the mucous membrane, by reason of this arrangement, may simulate trachoma formations. Appropriate treatment soon clears up the diagnosis, which may have already been indicated by a microscopic study of the secretions.

Ordinarily, a typical case of trachoma is easy of diagnosis. On the other hand cases which have been masked by treatment and those which are atypical require great care and nice discrimination. Such cases must be held under observation with or without treatment, as the condition warrants, and the true nature of the process will soon manifest itself, clearing up entirely in the one case, remaining stationary or becoming more pronounced and characteristic in the other.

A condition called adenomatous conjunctivitis by the writer, for the want of a better name, may be mistaken for the so-called brawny trachoma of Stellwag. It is occasioned by a prolonged non-specific irritation superimposed on an individual idiosyncrasy. It is confined to the ret-

rotarsal fold, and is characterized by a hypertrophy of the normal lymphoid follicles of that region, which assume a frog-spawn-like aspect. In this condition there is no infiltration, consequently no cicatrization. Under suitable treatment this condition may be relieved without leaving the distinctive traces of trachoma.

The brawny trachoma of Stellwag is simply a coalescence of trachoma follicles into distinct masses in a conjunctiva already richly infiltrated with lymphoid cells. Other usual characteristics of trachoma are also present, notably, infiltration and thickening of the conjunctiva.

CONTAGIOUSNESS OF TRACHOMA

In recent years a tendency to minimize the contagiousness of trachoma has begun to manifest itself on the part of certain members of the profession and others, either from the standpoint of personal interest or that of insufficient powers of observation and deduction.

Cases of trachoma running into the hundreds of thousands are awaiting in European ports the removal of restrictions, in order to migrate to America. When it is remembered that friends and relatives of these people acquire the franchise within five years after arrival, and, in many instances, hold the balance of political power in our dense centers of population, it is quite credible that such a propaganda may be instigated from personal and selfish considerations, rather than broad and patriotic motives.

The high standard of living obtaining in this country militates against the spread of trachoma, it is true, but such conditions may not continue indefinitely. The increasing high cost of living is causing the pinch of poverty to be felt more

and more. To some meat has now become a luxury. Congested districts are becoming more congested, and high rentals tend to overcrowding. Poverty begets carelessness in personal hygiene and is the handmaiden of ignorance. Combine ignorance, lack of personal cleanliness, and overcrowding, and sow in such soil the seed of trachomatous infection, and its contagiousness will manifest itself abundantly.

It is a well-known fact that known bacteria gain or lose in virulence under favorable conditions of environment or otherwise. Analogously the same reasoning may apply to the infecting agent of trachoma. Witness such a favorable soil among the Indians of the Pine Point District of White Earth Reservation, of this state, recently surveyed by the writer in co-operation with the State Board of Health. Over 50 per cent of the Indian population of this district are afflicted with trachoma. The writer examined a group of seven related Indians, overtaken by the roadside. One of these was an infant in arms, therefore a negligible quantity. Four of the remaining six had trachoma.

The oft-quoted 48 cases reported by Scheres-chewsky, that occupied the same compartment on the S. S. Oldenberg, infected in the course of the voyage by four cases in acute exacerbation, is certainly illustrative of the contagiousness of trachoma under favorable conditions.

Similar experience has been recorded by the writer, during his service at the Port of Philadelphia, Penn., in 1910. Thirty-five acute cases of trachoma were discovered on the arrival of one vessel and twenty-nine on another. That these cases developed on shipboard after passing inspection at the German frontier and at the port

of embarkation is certainly indicative of a common source of infection, rapid development, and marked contagiousness.

Dr. C. W. Bray, of Biwabik, pointed out to the writer a small frame boarding house on the outskirts of that town, in which twelve cases of trachoma developed among miners boarding there.

The following extract from the *Journal of the American Medical Association,* May 4, 1912, is explicit as to the contagiousness of trachoma.

TRACHOMA IN HUNGARY.

Although the government makes every effort to check the spread of trachoma by employing specialists in trachomatous districts, still the disease is appearing in new regions where formerly trachoma was unknown. In some districts in southern Hungary there are so many trachoma cases that special schools with trachomatous teachers have had to be erected for trachomatous children. The number of soldiers who have to be dismissed from the army on account of trachoma has grown in recent years to such proportions that the minister of war has decided to form trachomatous regiments with trachomatous officers, because, if all the trachoma cases were further to be dismissed from the army there would be serious deficiencies in the number of soldiers. Another advantage will be gained thereby. It sometimes happens that a soldier, weary of service, simply goes to a trachomatous friend and has the latter insert a penny under his eyelid. Then the soldier puts the infected penny under his own lid and rubs it well to get the disease; and in every case he gets it. If trachoma is no longer a ground for exemption from service, the soldiers will not risk their eyes in this way.

Instances could be multiplied to show that trachoma needs a special environment only to become extremely contagious.

DURATION OF CONTAGIOUSNESS

The duration of contagiousness of a case of trachoma is an unknown quantity. The contagious element is contained in the moist secretion, therefore, an eye not secreting is less liable to convey contagion than one which does. A quiescent trachoma may undergo acute exacerbation, or become inflamed from attack by other organisms. It is possible for the secretions from such eyes to contain the infecting agent of trachoma.

Since the adenoid tissue of the conjunctiva is the seat of the disease, it may be said to exist until such tissue has been replaced by scar formation. Consequently trachoma is certified by the officers of the Public Health Service, as a dangerous, contagious disease of the eyes until the process of cicatrization shall have been completed. To do otherwise would leave a wide margin to personal equation that might, in all sincerity, admit to the country cases that would subsequently light up and spread contagion.

TREATMENT

Treatment of trachoma has run the therapeutic gamut, from antitoxin to zinc. Indeed, this is not to be wondered at, because no one method of treatment can be employed with any degree of specificity or as a matter of routine. Each individual case must be treated in accordance with the indications. However, certain broad principles may be laid down as a guide to the measures that should be employed, to-wit: Modify inflammation, control reaction, hasten absorption, and prevent scarring.

The earlier treatment is instituted, the greater will be the success in arresting the disease.

Generally speaking, in the stage of invasion, when the conjunctiva is swollen, red, and juicy, some preparation of silver should be used or the glycerite of tannin, with or without the use of cold applications. On the other hand, a firm, pale conjunctiva, with granulations and scant secretion, requires stimulation, using the copper stick to excite reaction as an aid to absorption.

Some cases do very nicely under the mildest kind of treatment, and in others it often becomes necessary to discontinue treatment for a time, especially when too violent reaction ensues.

Grattage, using a tooth-brush and a $\frac{1}{500}$ mercuric chloride solution, is brutal and causes too great laceration of the conjunctiva. The method of Coover[14] is analogous. He uses No. 0 to 00 sandpaper and general anesthesia. The paper is cut into suitable strips, dipped into alcohol and burnt off, for sterilization, and the whole conjunctiva brisky rubbed. Coover claims this method is applicable to all forms of trachoma, that it is followed by very slight reaction, and that the after-treatment by the copper stick is not necessary.

Fernandez[15] claims excellent results for the method of LaTorro of Vera Cruz. The conjunctiva is cocainized, using a 10 per cent solution. A cotton swab, soaked in distilled water, is impregnated with powdered salicylate of sodium and rubbed firmly over the diseased conjunctiva. The treatment is repeated every three or four days. Fernandez claims to have failed of cure in less than 10 cases out of 400. It is significant that the cases were all acute.

Smith[16] of Calcutta has employed subconjunctival injections of cyanide of mercury in 1,500 cases of trachoma.

Twenty minutes before the operation he administers two grains of opium to counteract the severe after-pain. The eye is cocainized by the instillation of a 10 per cent solution of cocaine. A speculum is introduced, the eye fixed, and drawn down; and twenty minims of a $\frac{1}{4000}$ solution of cyanide of mercury is injected beneath the bulbar conjunctiva in the upper fornix. The palpebral and bulbar conjunctivæ become very edematous, subsiding in five or six days, leaving the conjunctiva deeply injected. If necessary, he gives a second injection on the sixth or seventh day. He claims excellent results in all cases but one, in the early stages of the disease. His best results were obtained in pannus.

A serious objection to any form of injection is the liability of the formation of fibrous nodules in the conjunctiva.

My friend, the late Dr. Kassabian[17] of Philadelphia employed the *x*-rays in some cases of trachoma, in the Philadelphia Hospital, with but indifferent success. Even if this remedy were successful, the great danger of burning the cornea, with disastrous results, would militate against its general employment.

Treatment of trachoma with radium has not been successful. It requires weeks of treatment, each exposure of considerable duration, to produce any reaction.

Horston[18] claims to have effected a cure in forty or fifty cases of trachoma treated with carbon dioxide snow, requiring from five to eighteen applications. It is not applicable to acute cases with secretion and edema. The powerful escharotic effect of this remedy is well known. The potential damage of a remedy, the time of application of which is measured in sec-

onds, does not recommend its use, especially in cases where other and better remedies can be employed.

Jequirity has been employed with the intention of causing absorption of trachoma follicles in the course of the inflammation excited thereby.

Hawley[19] of Chicago reports four cases with brilliant results in the one and not so good in others. Jequirity has been known to cause loss of eyesight, and its employment is not considered justifiable.

Expression with roller-forceps, followed by the application of astringents, enjoys a great and deserved reputation in the treatment of trachoma. This method should never be employed while the eye is acutely inflamed. The best results are obtained in cases after subsidence of acute inflammation, with scant secretion, and in which the follicles are large, superficial, and soft. In firm, resistent conjunctivæ it may be necessary to scarify before expressing. The operation is simple and may be done under local anesthesia. The greatest gentleness commensurate with thorough evacuation of follicles must be employed, avoiding needless laceration of the conjunctiva, to prevent scarring. Great care must be exercised to search out and express every follicle, else re-infection may take place. Any of the various forceps devised for this purpose may be used.

The after-treatment consists in the local application of cold to allay inflammation and an occasional eversion of the lid to prevent adhesion of folds of the conjunctiva with the formation of pockets and symblepharon. Subsequently, reaction may be excited by use of the copper stick.

Expression is the operation, *par excellence,* in children.

Excision, as devised by Heisrath[20], modified by Kuhnt[21], and practised in this country by Wooton[22], and others, bids fair to become the ideal treatment in certain selected cases of trachoma. The operation is described by Crigler, in his most excellent article on trachoma, appearing in the *Journal of the American Medical Association,* March 30, 1912.

According to Boldt[21], simple excision of the fornices is indicated in trachoma confined to the fornices: (1) when other methods have failed, or on recurrence; (2) when the tarsus or bulbar conjunctiva is invaded; (3) in corneal complications; (4) in individuals who come from a trachomatous horde and have to return to it again.

The conjunctivotarsal excision is indicated: "(1) in all chronic forms and those in which there is infiltration and thickening of the tarsus, with or without corneal involvement; (2) in extensive chronic trachoma of the fornices and tarsi, independently of actual changes in the tarsus, if the cornea is already involved or threatens to become so; (3) in gelatinous trachoma, even when confined to the fornices, if the convex edge of the tarsus shows typical thickening; (4) even in cured trachoma of the fornices, if the palpebral conjunctiva and tarsus are gelatinous or threaten to become so."

The operation is contra-indicated in early cases without corneal complications, and in other cases with threatening zerosis.

In Germany the advocates of the excision method of treating trachoma are enthusiastic and increasing in number. Unfortunately, the writer is not in position to express an opinion based on

personal observation. It is claimed this method abbreviates the disease to a few weeks; that there are no bad after-effects; that the lids move normally; and that corneal complications are avoided.

Due attention must also be paid to any complicating dyscrasia or debilitated state of health, and every effort made to improve the sufferer's general condition when such measures are indicated.

The treatment of pannus requires separate consideration. Prophylaxis is better than cure. The earlier a case is seen and placed under proper treatment, the less liable the pannus is to intervene. As stated above, when pannus threatens, excision is indicated, according to German authorities. Cases of pannus that do not respond readily to astringents have been treated surgically, and good results have been reported. Cases in which there is considerable swelling and thickening of the conjunctiva may be relieved by an external canthoplasty.

In other cases a portion of the conjunctiva next to the corneal margin is excised, even to the whole extent of the corneal margin if the pannus involves the whole cornea. Simple incision will put an end to the vascular infiltration in mild cases.

Goldzieher[23] claims good results in pannus from the inoculation of secretion taken from the eyes of infants suffering with gonorrheal ophthalmia. This certainly seems a dangerous practice, in view of the destructive effect of gonorrheal virus on the cornea. It is also to be hoped, from a public health standpoint, that ophthalmia neonatorum is not to become so common as to

admit of the general employment of the secretion in the treatment of trachoma.

Dr. Smith's cyanide of mercury injections have been referred to already.

In advanced trachoma, pannus may be treated by massage, not only with beneficial effect on the pannus directly, but also by hastening absorption of lingering infiltration in the palpebral conjunctiva. In late pannus, Hornback[24] advises stretching of the lids, which is accomplished by introducing the tip of the finger beneath the lid, of a cocainized eye, and making firm traction in the direction of the outer canthus to avoid wounding the canaliculi. He then applies the selected medicament by means of a stiff applicator wound tightly with absorbent cotton, and introduced beneath the lid. By this method he claims to employ dilatation, friction, massage, and medication in one maneuver.

An entropion operation, in conjunction with an external canthoplasty, is demanded when the cornea is kept in a condition of constant irritation from trichiasis.

PROPHYLAXIS OF TRACHOMA

The best treatment of trachoma is prophylaxis. The study of prophylactic measures is of importance to every community in which trachoma is prevalent.

The cosmopolitan population of Minnesota, in connection with conditions revealed by a survey recently made by the writer in co-operation with, and at the instigation of, the State Board of Health, renders consideration of the prophylaxis of trachoma of prime importance to the public health authorities of the state.

In May of this year, in co-operation with Dr.

H. W. Hill, Director of the Epidemiological, Division of the State Board of Health, a preliminary survey was made of portions of the White Earth and Leech Lake Indian Reservations for determination of the reported prevalence of trachoma among the Indian population.

At Pine Point Sub-Agency, White Earth Reservation, an examination of about one-third the total estimated population of this district revealed 31.4 per cent of trachoma in the whole population. A detailed canvass, impracticable at the time, would undoubtedly have shown 50 per cent or more of infection in this district.

An examination of four boarding-schools and one day-school, White Earth Reservation, and one boarding-school and day-school, Leech Lake Reservation, a total of 413 Indian pupils, revealed 127 cases of trachoma, or 30.7 per cent, indicative of a general infection of the population. In addition 1,428 public school children, in Mahnomen, Becker, Hubbard, and Cass counties, at points contiguous to the reservations, were examined, only three cases of trachoma were found, and these in children of mixed blood.

The facts established by this survey are: (1) the Indian population is a threatening focus of trachoma infection; (2) the disease has not spread from them to the contiguous white population; (3) the mixed blood is the agent by whom infection may be spread to the white population; (4) the necessity for preventive measures.

A like survey of portions of the mining population and of public-school children of the Mesaba Range was made by the writer, assisted by Dr. A. J. Chesley, of the State Board of Health. In all, 1,319 miners in eight districts were ex-

amined, with 34 cases of trachoma, or 2.6 per cent, found.

A significant fact is, that trachoma was found among the foreign-born miners in every district examined. Also 6,861 school-children of these districts were examined, and nine cases of trachoma discovered among them. The facts established are these:

1. The mining population of the Mesaba Range is infected.

2. The disease has, to a limited extent, gained entrance to the public schools.

3. Preventive measures are to be enforced to avoid further spread.

Consideration of prophylactic measures should be from the standpoint: (1) of the general government; (2) of the State, as represented by its Board of Health; (3) of the community, and (4) of the individual.

The government is daily enforcing one of the strongest prophylactic measures for the prevention of the spread of trachoma through its examination of arriving aliens for trachoma by officers of the Public Health Service, thus preventing the introduction of new cases to the country.

Prior to 1897 but few cases of trachoma were deported on arrival, permitting the establishment of infected foci in those states and communities most affected by immigration.

Thousands of cases of trachoma are now awaiting removal of restrictions, in order to reach this country. Many hundred seek admission in spite of such restrictions, of whom some gain entry in an illegal manner. The lowered percentage of trachoma in our large eastern cities, which receive the bulk of immigration, is

an eloquent tribute to the thoroughness of this inspection and to the value of prophylactic measures.

The Indian situation is in the hands of the general government, through the agency of the Indian Medical Service. Every Indian is a prospective citizen of the state under the provisions of the Clapp Act, thus complicating the situation.

The State is protected from this source in proportion to the thoroughness with which the disease is combated in the Indian population. The present situation cannot be handled successfully so long as the Indians are scattered throughout the reservations, living in isolated dwellings. Trachoma requires constant supervision, and until the Indians are gathered into small villages under police control and medical supervision, with proper hospital facilities, any effort to stamp out the disease among them is doomed to failure. The modern Indian, in his ignorance, with his superstitions and his insanitary mode of life, furnishes a fertile soil for the propagation of trachoma.

On the part of the State, trachoma should be declared a reportable disease, to the end that every case may receive due and appropriate treatment. It should also be made conditionally quarantinable, in order that any case, through inability or disinclination, failing to abide by the rules and regulations controlling such, as prescribed by the State Board of Health, may be apprehended and treated, at State expense, until in condition to be released without danger to others.

Every community or municipality should provide for a proper medical inspection of schools, the same to be under the general supervision of

the State Board of Health, acting through the local Board.

Every case of trachoma should be excluded from school for such time as may be determined by medical inspection, when it may be readmitted without danger to others. In fact, in trachomatous communities, every acutely inflamed eye should be regarded with grave suspicion and excluded until the true nature of the case is determined, or the inflammation has subsided.

An examination of school-children will furnish a true index to the trachoma situation of any community. For that reason the writer cannot recommend too strongly the establishment of such inspection, especially in territory contiguous to Indian reservations and in the mining districts.

All school lavatories should be provided with individual or paper towels. Running water must be used for washing the hands, a faucet controlled by foot-pressure being used for the purpose.

The exclusion of trachoma from the schools will not protect the community, nor should responsibility end here. The child should be followed to its home, the nature and danger of the disease carefully explained to the family, and methods of individual prophylaxis carefully taught.

It therefore becomes necessary to establish a system of school nursing in connection with the medical inspection. It should be the duty of such nurse or nurses, to visit the houses of trachoma cases daily, to apply the necessary treatment, under the physician's direction, of course, and to see that proper precautions are observed.

A final word regarding the responsibility of the great industrial institutions to the community in which they are located: Invariably such institutions employ large numbers of foreign laborers. These companies owe it to themselves and to the community to cause an examination to be made of every applicant for employment, rejecting all cases of trachoma. This practice, if universal, would put an end to importation of trachoma. The disease cannot enter this country except in an illegal manner. If these people knew beforehand that they could not secure employment, it would do more to discourage the attempt to enter the country than any other measure.

The State Board of Health should be empowered, by special act if necessary, to make such inspections and prescribe such regulations as may be necessary to control the present foci of infection in the mining population of the State.

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